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CANADA GESE, A PRELIMINARY SKETCH BY ALLAN BROOKS

THE CONDOR

VOLUME 49

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LIFE HISTORY OF THE MARBLED WOOD-QUAIL

By ALEXANDER F. SKUTCH

The Marbled Wood-Quail (*Odontophorus gujanensis*) is widely distributed through the forested regions of northern South America, but in Central America it ranges no farther north than southwestern Costa Rica, where it is represented by the Chiriqui race (*O. g. castigatus*). Birds of this species are stout, compactly built, and somewhat larger than the familiar Bob-white of North America. A formal description of its plumage is necessarily so long and intricate that it can leave no distinct picture in the reader's mind; suffice it to say here that at a distance the bird appears to be clad in fairly bright brown, but close at hand it is seen to be beautifully variegated with browns and buffs, of a bewildering variety of shades all exquisitely blended together, and flecked and vermiculated with black. The breast and abdomen are finely and irregularly barred with buff or cinnamon-brown and blackish. There is an erectile crest of long, deep brown feathers. The lores and region about the eyes are bare of feathers, displaying bright orange-red skin, more extensive and somewhat deeper in hue on the male than on the female. The male is also slightly larger than the female. In both sexes the eyes are dark, the bill blackish, and the legs and toes plumbeous.

This wood-quail inhabits the lowlands and foothills of the Pacific side of Costa Rica, south of the Gulf of Nicoya, and adjacent portions of the republic of Panamá. In the basin of El General at the head of the Térraba Valley it is fairly abundant between 2000 and 3000 feet above sea-level, and nests at least as high as 3000 feet. It is found chiefly in the dimly lighted undergrowth of the lofty rain-forest of this region, but it often wanders out into adjoining areas of tall second-growth woodland, and at times, especially while the sun is low, even into neighboring plantations. Gregarious at all seasons, these birds roam through the woodland in small coveys containing from five to eight well-grown birds—never, in my experience, more. Often they travel in single file.

When alarmed by the approach of a man, the quails prefer to escape by walking or if need be running rapidly over the ground rather than by flying. They use their wings with great reluctance; but if surprised at close quarters, as when one suddenly comes upon them at a bend in a forest trail, they rise with a rapid burst of wing-beats, ascend rarely higher than a man's head, and fly a short distance to disappear in the dense undergrowth. Carriker (1910:387) states that when thus driven to take wing, they "usually alight in the low trees and sit perfectly still for some time before flying off again." I myself have never seen them do this. Sometimes when alarmed they "freeze" on the ground. One morning in January, while I roamed through the forest near my house, a quail suddenly flew up from the ground a short distance ahead of me. Suspecting that it had left a nest, I searched through the undergrowth, but found nothing. After a few minutes, a second quail of a sudden rose into the air only a yard or so from where I stood. Apparently it had squatted motionless on the brown leaf litter, with which it blended so well that I had failed to see it until it moved. With a violent and apparently strenuous

effort it rose about two yards, then descended gradually amid the bushes. I have also seen the quails squat motionless on the ground when suddenly alarmed by a squirrel.

FLOCK BEHAVIOR

As a rule, when I have tried to stalk a covey of Marbled Wood-Quails, they have walked off through the dark underwood more rapidly than I could force my way through the tangled growth of bushes, vines and the climbing fern *Salpichlaena volubilis*. During my first year in El General, I glimpsed the quails only as dark figures which faded away through the underwood before I could see enough of them for identification. But in subsequent years, in lower parts of the valley, I found them less shy, and on a few occasions amazingly fearless of me. Then I was able to watch them for substantial periods at a range too close for the use of binoculars and to learn something of their behavior as a group.

The first of these memorable encounters took place on February 19, 1939, near the Quebrada de las Vueltas about two miles from the village of San Isidro del General, and was described in detail in my journal that same evening. Late in the afternoon, while roaming through a grove of bananas, plantains and coffee bushes shaded by *Inga* trees, I met a covey of five wood-quails beneath a close-set mat of bananas. They went off unhurriedly, then paused at no great distance to forage among the dry dead leaves that littered the ground. They were probably a family group; but all were well grown and not to be distinguished by their plumage; and the slight differences in size between them, to be noticed only when they were close together, might have indicated differences of sex rather than of age.

The quails scratched away the fallen litter with long, deliberate strokes of their plumbeous feet, using either the right or the left, but only one at a time; then with their short black bills they picked up whatever edible particles the removal of the leaves revealed. They were not shy, for I stood watching them at a distance of only four or five yards, and very inadequately concealed by the intervening vegetation. From time to time one would look at me with large, dark eyes set in areas of bright orange-red skin which gave an expression of alertness, and raise into a crest the long, dark brown feathers of the crown; but after a few moments of this inquiring attitude it quietly resumed its foraging.

When, after many minutes, the flock moved off through the grove to forage in another spot, I quietly followed; and so for the space of an hour or more I watched them continuously at no great distance. Once, in an open space, I approached to within about three yards of where they fed, without alarming them. Usually the five fed in a compact group, but at times one or two would wander off a few yards from the rest. They appeared to live in the most perfect amity; no objection was raised when one approached to pick up morsels in a space which another had cleared, standing close beside the first or even in contact with it, and plucking the food almost from beneath its body. When one quail found something too big to swallow at a gulp, such as a small dry banana, it did not scurry off with its prize to escape the pecks of greedy neighbors, in the manner of domestic chickens, but ate in peace where the food happened to lie, or amicably allowed its companions to share it. If it did pick up and carry a large piece of food, it was to follow its friends as they moved forward to new ground. As they hunted, the quails constantly murmured low, soft, liquid sounds.

The birds foraged for a good while close about the remains of fallen bunches of bananas, too small and meager to have been worth the owner's time to carry them home. Doubtless they found a variety of insects which had been attracted by the decaying vegetable matter, but they also ate eagerly the remnants of the pulp of green bananas

which had dried hard and white during many rainless weeks, pecking it industriously out of the black and shrivelled skins.

While I watched them pecking at the remnants of a raceme of bananas long since fallen, a squirrel in the crown of a neighboring banana plant noticed me and shouted harshly in alarm. Instantly four of the quails squatted down on the dry leaves in plain sight of me, while the fifth ran off behind the mat of bananas. I stood without moving, and soon the birds rose up again and resumed their eating. The squirrel, becoming bolder, descended to the ground and approached the blackened remains of the raceme, for he also was fond of the hard white remnants of unripe banana pulp. The quails scarcely feared him. When the mammal had approached within a foot of the nearest, it directed a peck toward him and he drew back slightly. When he again advanced, the nearest struck out with a wing in his direction and retreated a few inches; the squirrel stopped short and the birds continued to eat. After they had moved on, the squirrel nibbled at what they had left.

The birds moved over the ground by little runs with the neck stretched forward. I followed them until they circled back to the edge of the forest in the failing light. They foraged for a while along the forest margin, then drew farther inward where the tangled bushes and vines made it difficult for me to follow. I had hoped to keep them in view as the dusk deepened on the chance that they would deliver the full, mellow note, long-continued with an undulatory movement, which I had so often heard coming out of the dark undergrowth of the forest as night drew down, but had never traced to its source.

A second entry in my journal, written on March 5, 1943, when I was living on my farm beside the Río Peña Blanca in the basin of El General, gives a somewhat different picture of the behavior of the wood-quails. In the morning I came upon a covey of six or seven in the tall second-growth woods adjoining the riverside pasture. They were all well grown, if not mature, and were scratching among the fallen dead leaves at the very edge of the grove, now with one foot and now with the other, all staying close together in friendly fashion. As they searched for food they uttered soft, melodious, contented notes. After a while one jumped upon a log, and soon another hopped up beside him. The second then bent down and billed the legs and the feathers of the abdomen of the first. After it had repeated this a few times, the first hopped upon a slender inclined trunk, then walked up to a point where this was horizontal, about a yard above the log. The other promptly joined him here; and they perched close side by side, alternately preening their own and the other's feathers. Each billed the plumage of its companion's head, and of the abdomen between the legs, and sometimes seemed to run its bill over the legs as well. Repeatedly each bent forward to perform this service for its companion. After a while a third joined the two on the stem and proceeded to preen as they did. The one in the center, in addition to its own, billed the feathers of both its neighbors, and received this attention from each in turn. One of the end birds sometimes reached past the middle one to bill the legs of that on the other end. Presently a fourth joined the preening party on the slender trunk, while two more on the ground helped each other attend their plumage. The head and neck, the abdomen between the legs, and the legs were the parts where the quails chiefly billed their neighbors. Although I have seen birds of numerous kinds bill the feathers of their mate's head and neck—I watched a Swainson Toucan do this the other evening—I cannot recall having ever before seen a bird preen another's under parts. Apparently these stout quails find it more difficult than most birds to reach the lower regions of their own bodies. Also, being terrestrial, they must have been greatly annoyed by the red-bugs or chiggers which during the preceding week of somewhat drier weather had become unpleasantly abundant in the forest. Probably the abdominal preening was the result of this irritation.

These quails were no shier than those of the covey I had followed four years earlier and allowed me to watch them close at hand, scarcely concealed by the foliage. When they had completed their toilet, they walked slowly away, scratching for food as they went. I never saw one peck at another as domestic chickens do.

Recently there have been published numerous observations on the "peck-order" of domestic chickens and other birds; and the question of dominance among birds, both social and asocial, has received much attention from ornithologists and students of animal psychology. The domestic fowl with which studies of this character are so often made are birds whose natural traits have been greatly modified by domestication; the strains commonly bred in the Western Hemisphere are, for example, unable to survive without human care, even in regions where conditions are more or less similar to those of their ancestral home in the Old World tropics; and one cannot help but feel that through artificial selection many of their original characters have been lost. The genus *Odontophorus* is now classified in the family Phasianidae, which includes also *Gallus*; and since it is not often that one can follow closely the movements of the wild members of this family, I was particularly interested to see whether the wood-quails would exhibit any behavior comparable to the "peck-order" of their domestic relatives; but I saw nothing of the kind.

In other Central American birds, too, I have found slight indications of the "dominance" of one individual by another, and none at all among those most highly social in their habits, among which are Groove-billed Anis, Banded Cactus Wrens, White-tipped Brown Jays and Black-eared Bush-tits. Recently Schneirla (1946:396) has insisted "that dominance theory is an inadequate basis for the study of vertebrate social behavior." Because "dominance" is a manifestation of aggression on one side and withdrawal on the other, it is disruptive and "more or less counteractive to factors which hold the group together." He believes that dominance is most often manifested when "positive unifying factors are relatively weak but are somewhat artificially reinforced by special conditions, such as food scarcity or sexual receptivity (which serve to heighten reactivity to specific stimuli from other individuals), or by physical confinement of the group." The majority of studies of dominance among birds have been made either with captive individuals or at feeding-shelves, where the presence of abundant rich food causes an abnormal concentration of the birds, and where also they may often be under tension because they are more accustomed to alight upon a bough than upon a board.

As a more promising basis for the study of social integration, Schneirla suggests the extension to the vertebrates of William Morton Wheeler's concept of "trophallaxis," originally applied to social insects, where it signifies the reciprocal exchange of food or of equivalent tactual and chemical stimulation among the members of the colony. Among birds it is possible to recognize a number of relations which exemplify trophallaxis in its more extended sense. Some of these are:

1. Mutual assistance in finding food.
2. Reciprocal preening. In the most highly social birds, individuals other than mates may preen each other; with less social species, mutual preening appears to be limited to members of the mated pair; while the majority of birds, I believe, preen only themselves. (References to preening are scattered incidentally through a vast amount of literature, and no one, so far as I know, has gathered them together; this effort might lead to interesting conclusions.)
3. Roosting together. Among the most social birds, a number may build and sleep in a single nest for mutual warmth; at a lower degree of sociability, the mated pair may sleep together, or the mother with her fledged young; the least social birds sleep singly, not in contact with each other, although they may huddle together under stress of se-

verely cold weather. The whole series is exemplified by such families as woodpeckers and wrens (Skutch, 1940 and 1943).

4. Co-operation in the care of the young. Numerous examples of this have been recorded; some are given by Nice (1943:242-243) and Skutch (1935).

5. Companionship. Among highly social animals, this is seemingly sought for its own sake. The animal feels distressed when alone, and if it cannot find companions of its own kind, may form the most incongruous friendships. Instances of this will be familiar to everyone from personal experience or from reading; some unusual ones are given by Dobie (1945:9-12).

Among the Marbled Wood-Quails, the bonds between the members of a covey are strengthened by mutual assistance in finding food, by reciprocal preening, and apparently also by need of companionship. Unfortunately, we know nothing about their way of sleeping; possibly they sleep on the ground in a compact group, as Bob-whites do. Observations which will be given later indicate that the whole covey takes an interest in the young.

VOICE

I have never had the good fortune actually to watch the quails while they sang, but from a good deal of indirect evidence I believe that I am correct in attributing to them a uniquely beautiful call which I have heard countless times amid the forest of El General, sometimes issuing from the underwood where I had seen these birds disappear; but always they have stopped before I could come in sight of them. The song is an amazingly rapid, continuous flow of full, mellow, liquid notes, rhythmically rising and falling in pitch, and sounding, as nearly as I can paraphrase it, like *burst the bubble burst the bubble burst the bubble . . .*, repeated many times, until one wonders how any living creature can maintain so rapid a tempo for so long a period without being forced to pause from lack of breath. Although the song may be heard at any hour of the day, most commonly it rings forth in the evening twilight, after most other bird voices have been hushed for the night. Sometimes I have heard it break out in the dead of a moonlit night, and more rarely during a dark and moonless night. It is one of the forest sounds of the dry season, which in this region covers the first quarter of the year, and is far less often heard during the months when rains are heavy. Under any circumstances the wood-quail's song would be an arresting performance; but the hour at which it is heard, the virtual impossibility of ever glimpsing the performers amid the dense underwood of the darkening forest, the feelings of urgency and excitement which so rapid an utterance inevitably evokes, all surround it with an air of mystery and unreality which enhance its strange beauty.

Chapman (1929:275) paraphrases the song of the related Colombian Marbled Wood-Quail (*O. marmoratus*), as he heard it on Barro Colorado Island, as *corcorovado, corcorovado, corcorovado*; and sometimes I can imagine that the quails in El General are saying the same thing, although more often the four-syllable *burst the bubble* seems to fit their song more closely. In an aviary he watched two wood-quails, presumably male and female, which faced each other at a distance of a foot or two and sang a duet in perfect unison. "As one called *Corcoro* the other added *Vado*. The syllables were uttered rapidly, the timing was perfect, and the performance clearly revealed the method by which the song of this species is produced." Doubtless the wood-quails of the Chiriqui race perform in the same antiphonal fashion; but as with some of the wrens, the articulation of the two parts is so perfect, that unless the hearer stands between the performers, he would never suspect that the song came alternately from two throats.

The Marbled Wood-Quails have many utterances in addition to their song. Sturgis (1928:30) mentions the "many lovely, sweet and liquid whistling notes" of a pair of

the Colombian race which she kept in captivity for three weeks. I have already mentioned the low, soft, liquid sounds, suggestive of contentment, which were constantly murmured by the coveys that I followed closely. A female which I watched incubate would walk toward her nest, and sometimes away from it, uttering low, musical, liquid, undulatory notes, *witty witty witty witty* . . . , long-continued and at intervals punctuated by a low, somewhat whining sound. Her mate, when he came to call her from the nest or escorted her back to it, delivered a long-drawn *caaa caaa caaa* (the *a* as in *draw*), which seemed to come from some distant source even when its author was close by. At times the female replied from the nest with a whispered version of the same note. Under stress of greater excitement—as on the morning the chicks left the nest—the male quail interrupted his usual *caaa's* to deliver a low, deep *cahoo*. Another frequent utterance of this pair was a liquid *quit*.

NEST AND EGGS

On the afternoon of January 12, 1937, while I dwelt in the straggling settlement of Rivas on the northern side of the basin of El General, Everardo, the little boy who brought me eggs for the table, announced that he had found eggs of another sort—those of a wild bird, for which I paid a higher price, provided that they were shown to me where they had been laid, without being touched. He said that they belonged to some very rare bird whose name he did not know, which was not surprising, since the wood-quail, like most other species of birds in El General, has no local name. Insisting that I go at once to see the nest, he led me along the path which wound steeply upward through the forest to the *campo santo* on the level summit of the eastern ridge, then across the burying ground into the woods on the farther side. Here the Indians had long ago buried their dead; and the ground between the trees was everywhere broken by deep pits dug by those of the present inhabitants of the district who hoped to find some of the golden ornaments which the aborigines at times placed in the graves of their deceased. To add to the confusion and difficulty of walking through this tract of forest, a number of the trees had been recently felled for lumber, and their trunks, lopped-off branches, and other smaller trees borne down by the great ones in their descent, littered the ground and greatly impeded our movements. In a section where the canopy of trees was thin and the undergrowth correspondingly dense, we reached the nest. Although my guide pointed it out to me from a distance of two or three yards, it was so inconspicuous and well concealed that he was obliged almost to touch it before I could distinguish it. He had discovered it by frightening up the birds as he worked his way through the undergrowth, and he said that two had fled from the nest, or its immediate vicinity.

The nest was in a depression in the ground at the base of a mound of earth raised up by the roots of an uprooted tree, close beside the prostrate trunk. The hollow was completely roofed over with dead leaves, supported by small sticks intermixed with them, forming a spacious, well-sheltered nest chamber with a round entrance on the side that faced outward from the mound. A slight litter of fragments of dead leaves, bits of fine sticks and other particles of vegetation covered the bottom of the depression; and upon this scant carpet rested two white eggs, considerably below the level of the ground in front of the doorway. The leaves which covered over the nest blended with those scattered about over the ground and made it difficult to detect the structure. The foliage of some low bushes growing in front screened the doorway and added to the security of the cleverly concealed nest. The altitude of this point was about 3000 feet above sea-level.

The white surfaces of the eggs bore dark strains from the dead leaves upon which they rested, and these seemed to indicate that they were already several days old. They were cold when I first saw them; and when, on visits during the two succeeding days, I likewise found them cold and deserted, I concluded that the nest had been definitely

abandoned, probably because the owners, whatever kind of bird they were, had been frightened away by the noise of sawing a hundred feet distant.

But a week later Everardo sent word that there were now four eggs in the nest; and when I visited it on the morning of the next day, January 20, I found the four there, but they were again cold. The two more recently laid could be distinguished from the first two by their unstained, immaculate whiteness, suggesting that the four eggs which formed the set had not been laid at uniform intervals. All four were of distinctly ovoid form, rather sharply pointed at the narrower end and without much gloss. They measured 38.9 by 27.8, 38.5 by 27.8, 40.5 by 27.4 and 38.5 by 27.4 millimeters.

In spite of much searching through the forests of El General during the next decade, I have found only one other nest of the wood-quail. This second nest was discovered on my farm on April 16, 1946. It was situated at the foot of a gentle slope, beside a little-used roadway, in tall second-growth woodland but not far from the primary forest which the lighter woods adjoined. From the outside the structure appeared to be a low mound of large dead leaves and coarse sticks, with an admixture of small green grass plants pulled up by the roots. It was difficult to distinguish from the surrounding litter of fallen dead leaves, with which it blended. In the side facing down the slope toward the roadway was a round entrance, leading into the deep chamber lined with dead leaves, and covered by the thick roof of sticks, leaves and green grasses. From front to back this chamber measured 10 inches, from side to side 5 inches, from floor to ceiling 5 inches, while the doorway was 4 inches in diameter.

The nest was empty when found. During the next week it remained without an egg, and I never saw the owners in the vicinity. At about two o'clock on the afternoon of April 23, I for the first time found the quails at the nest. Walking rapidly along the roadway, I surprised one standing ahead of me directly in front of the nest. For perhaps a minute, it remained quite motionless, in statuesque attitude, less than a pace from my feet. Then it walked deliberately off into the woods, voicing low, soft notes. Pretending not to see the nest, I continued down the roadway, then, after the quail had vanished, returned to look inside. As I stooped to the low doorway, a second quail burst out and walked rapidly off, uttering notes louder than those of the first. There was a single egg in the nest. Two days later, on April 25, the second egg was laid. The following afternoon the eggs had vanished, shells and all, probably taken by a snake.

INCUBATION

All that I know about incubation was learned at the first nest, found in 1937. It will be recalled that I first saw the full complement of eggs in this nest on January 20. On the following day I visited the nest at ten o'clock in the morning. For the first time I found it occupied by a bird and was able to confirm what I had from the first suspected, that it belonged to a wood-quail. The quail sat perfectly motionless while I approached and looked in at it, with my head only about a yard from the doorway. When I had seen all of its plumage that it was possible to discern in the covered nest, I stole away without molesting it.

On subsequent visits, I found the quail as brave and faithful to its nest as when I first met it there; and always I could look in at it with my head only two or three feet from the doorway, without causing it to move. If I visited the nest much before ten o'clock in the morning, I always found the bird absent and the eggs cold; but after ten o'clock I could depend upon finding the eggs covered. I noticed that the hollow in the ground which contained the eggs was of such depth that the eyes of the sitting bird came just about to the level of the surface in front of the doorway.

On January 23, at 10:20 a.m., I found the quail in the nest and decided to attempt to place upon its plumage a mark which would serve to distinguish it from the mate,

since the male and female of these wood-quails are difficult to distinguish by their natural coloration. I wrapped a small tuft of cotton about the end of a slender stick a yard or so in length and soaked the cotton in white enamel. The quail sat perfectly immobile while I touched her with the paint-saturated cotton and rubbed it around to make a conspicuous white mark upon the finely pencilled feathers of the breast. Since upon subsequent visits I saw only this marked bird in the nest, I concluded that this was the female.

On the following morning, at 9:45, I arrived with my brown wigwam blind and found the marked quail in the nest. She sat perfectly still, watching me fixedly, while I put up the wigwam only eight feet away from her. She did not even move when I cut or pushed aside some of the vegetation immediately in front of her, which was obstructing the view; nor when, with the end of a slender stick, I raked away a dead leaf which was almost touching her breast and concealing the white mark.

Watching at close range the behavior of a bird so shy and elusive as this wood-quail was one of the memorable experiences of many years of bird-watching. I devoted a total of about 26 hours to observation from the blind, before the eggs hatched, and believe that I can best convey to the reader the interest of these vigils, and what they taught me about the life of the wood-quail, by repeating the story as nearly as possible in the form in which it was recorded in my journal each day, while still fresh in mind.

January 25, 12:50 p.m.—I arrive and find the marked bird in the nest. The lower half of the doorway is filled with curled dead leaves loosely placed. They screen the foreparts of the bird, making it very difficult to see aught but her head, and that but dimly. These leaves seem to have been placed here by the bird herself since yesterday and add to her concealment. Looking into the nest from directly in front, at a distance of three yards, I now, in the bright middle of the day, see only a black, semicircular opening among dead brown leaves. Of the bird herself, I can with difficulty discern only the shining ridge of her black bill and the red skin of the lores. These points fit into no pattern, and are so indistinct that I should probably overlook them if I had not foreknowledge of the presence of the quail.

2:10.—A hard shower descends, but the rain soon slackens.

Now that it has become darker, the quail in the nest is quite invisible to me except when she turns her head sideways. Then I can see the broad zone of bright red skin which surrounds her shining eye.

The rain soon stops, but the afternoon remains cloudy.

5:50.—In the gathering dusk, I leave the marked bird invisible in her nest.

January 26, 6 a.m.—Returning to the nest as the forest begins to become light, I find that the quail has gone from the nest, which has been somewhat torn and disarranged during the night. In particular, the forepart of the roof has been torn away. The eggs, although cold, have not been injured. A few small feathers have been scattered about the entrance. It looks as though the quail has been attacked during the night; but the absence of blood, and the fewness of the feathers, give me hope that she escaped without serious injury.

I wait for about an hour in the blind, but since the bird does not return, I leave.

2:00 p.m.—The marked bird has returned to the nest. She sits far more exposed than she did yesterday.

January 27, 5:50 a.m.—I arrive at the nest in the dim early-morning light. In the beam of the electric torch, I find the quail with her head turned back among her feathers, asleep.

6:02.—She awakens, and I see the red skin about her eyes in the dimly lighted nest.

6:07.—While I am looking elsewhere, I hear a rustling of leaves in front of the blind, then a whirr of wings. The quail has suddenly departed the nest, without my seeing her go.

The day brightens, and the sun slowly rises into a fair blue sky. Some Swainson Toucans sing among the branches above my head. The male Salvin's Manakins call and make explosive *sna*ps with their wings in the undergrowth to my right, where they have their courts—little circles of bare ground amid the close-set saplings. The Wood Wrens repeat many times their clear whistled call. A pair of Orange-billed Sparrows move around me in the tangled undergrowth. A Gray-headed Tanager perches in a bush just outside the right window and repeats a whining note. A Sulphur-rumped Myiobius works at her nest, just begun at the tip of a slender, leafless, hanging twig twelve feet above the ground, where I can watch her through a side window of the wigwam.

9:10.—I hear a low, musical, liquid, undulatory calling, *witty witty witty witty . . .*, long-continued and at intervals punctuated by a low, somewhat whining note, and soon notice the quail approaching through the dense undergrowth to my right, walking unhurriedly over the dead leaves. She enters the narrow clear space in front of the blind, and as she walks steadily away from me toward the nest I have my first good view of her beautifully variegated upper plumage, colored with browns and buffs in a multitude of shades wonderfully blended. She appears larger than one would judge she could possibly be from watching her as she sits in the nest; and the bare skin around her eyes, which seemed red as I watched her in the nest, now, in the full light of the open, has a distinct orange hue. She continues without pause to the nest, stoops as she enters the low doorway, turns around and at once settles on the eggs, which have become quite cold during her long absence of three hours and as many minutes. As she snuggles down facing outward, I notice the conspicuous white spot which four days ago I placed upon her finely pencilled breast.

After she has become adjusted to her nest, I for the first time notice her mate, who moves around quietly, about twelve or fifteen feet distant in the dense undergrowth. He accompanied her only this far as she returned to her eggs, and now, without coming nearer the nest, he silently vanishes. This is the first time that I have seen the male, although Everardo told me that the pair were together at the nest when he found it. But now the male quail never comes near the nest.

12:30 p.m.—The marked quail has sat quietly on the eggs through the remainder of the morning. Without leaving her eggs she watches me take down the blind. She sits steadfastly while I place more dead leaves upon the roof above her, and arrange others in front of her, to screen her as well as I found her two days ago, before the nest suffered from the nocturnal attack. Once, when my hand comes very close to her, she gives a sudden start, but checks herself before she has risen from the eggs. I go, leaving her in the nest.

February 7, 5:45 a.m.—I arrive while the light is still dim beneath the trees and enter the blind, which was set up again during the quail's recess yesterday morning. I find the marked bird in the nest.

At about six o'clock I hear an unfamiliar, mysterious bird call, which I guess to be the voice of some big bird calling from afar, a long-drawn *caaa caaa caaa caaa*. After a while its source apparently moves around me from right to left.

6:15.—The quail steps from the nest, walks several feet straight toward me, then with a sudden whirr of wings rises steeply into the air and flies over the wigwam.

A minute later I am attracted by a rustling of the fallen leaves to something which moves over the forest floor to my left. Two quails, my bird and her mate, one following the other, walk past the wigwam at a distance of only a few feet, and pass beneath a fallen trunk which does not rest evenly on the ground, and which I can touch from where I sit. A sound uttered by the leading quail betrays him as the author of the strange calls which I have been hearing. His long-drawn *caaa* sounds far away even when he is less than three yards distant. The birds also utter a liquid *quilt*.

6:20.—The first horizontal rays of the rising sun filter through the forest on this steep, narrow ridge.

7:55.—I hear a low *caaa caaa* (much more subdued than at daybreak) as the male and female quails approach together, walking through the undergrowth to my right. Then I hear a few liquid *quits*. The male stops short about five yards from the nest, while the marked female advances, walks into the clear space in front of the blind, then turns sharply to her right and goes to the nest. She utters the rapid *witty witty witty . . .* as she advances. She stoops to enter, turns around, and settles down to incubate. Her mate silently vanishes.

9:15.—As I leave the blind, I approach to take a close look at the marked bird in the nest, and find many small brown ants crawling over her head. She seems not to mind, and does nothing to relieve herself beyond blinking her eyes when they walk over her eyelids.

February 8, 5:48 a.m.—I arrive at the quail's nest. The doorway of the nest is so obstructed by dead leaves that only the head of the quail, narrowly framed in an irregular aperture, is visible in the beam of my flashlight, which does not appear to disturb the bird.

6:10.—I hear the subdued *caaaing* of the male in the distance. The marked female arises and steps from the nest. As she does so she picks up with her bill some of the dead leaves which litter the ground in front of her, and with an upward toss of her head throws them over her back so that they fall upon the roof of the nest behind her. When she has thrown back a number of leaves, instead of walking a few feet from the nest and then taking wing, as she did on the two previous mornings that I watched, she turns to her right and walks slowly around the mound of earth at the base of which the nest is situated. When out of my sight she begins to answer her mate, who has continued to call, in similar but lower tones. Soon I hear low liquid notes, which I interpret as the quails' greeting to each other as they meet amid the undergrowth. Then I neither hear nor see them longer.

I examine the eggs and can detect no indications that they are about to hatch.

9:04.—I hear the low *caaa caaa* repeated over and over in a very subdued voice. In a few moments I glimpse the female among the bushes ahead of me, to the right of the nest. As she approaches slowly,

probably because her way is obstructed by bushes and litter (I can not see her now), she continues her liquid *witty witty* . . . , as always when she returns to her nest. The male continues to voice the low *caaa* in the bushes beyond the nest until the female has settled down upon her eggs and ceased to murmur; then I hear him no more. He did not once come within my very limited range of vision of objects on the floor of the forest.

When the female has composed herself upon her eggs, facing outward as always, she is almost completely screened in front by the dead leaves which she threw with apparent carelessness over the roof of the nest.

9:15.—I leave the marked quail in the nest.

February 9.—This morning, when I visited the wood-quail's nest a few minutes before nine o'clock, I found that she had already returned from her recess and was incubating, with her foreparts well screened by the loose leaves in the entrance. I decided that in spite of her presence in the nest it was important to see the eggs, to learn whether they are about to hatch. I advanced very close and in a tentative way touched a dead leaf within two inches of her head. After this tentative advance, I boldly extended my fingers to touch her head, about the only part of her body which her well-closed nest left free to be touched. When I had almost made contact, she dashed forward with a terrific burst of wing-beats which I was afraid might lift the roof off the nest. But about two yards away she came to earth and began to walk deliberately off, with the long, dark feathers of her crest raised up, and uttering the same liquid notes which she voices as she approaches her nest after a recess. Thus she vanished amid the undergrowth.

Her nest did not suffer damage from her rapid departure, beyond the displacement of a few loose leaves which I readily replaced. The shells of her four eggs showed not a chip; and holding them to my ear one by one, I listened in vain for the tapping of the little birds trying to escape.

February 12.—Yesterday morning, when I visited the wood-quail's nest at 7:55, I found that she had already returned from her recess. Her breast was so well screened by the dead leaves which lay in front of it that I could not see the white paint mark. To reveal this and make certain of her identity, I began to push the leaves aside with a short, slender stick. While I was so engaged, she suddenly flew from the nest, but alighted a short distance off, voiced her soft, liquid *witty witty*, and walked out of sight among the bushes. Then I examined the eggs and found them chipped, all in the same degree. The little quails had fractured the shell in just one spot, and pushed the fragmented portion slightly outward, but had not yet actually broken through. Holding the eggs to my ears, I could hear the tapping of the occupants, and their occasional weak peeps. Then I returned them to the nest, set the blind in its former position, and went away.

I returned to the blind at 2:15 p.m. and sat watching until 5:30. All this while the quail remained quietly on her eggs, well screened by the loose dead leaves in front of her. Her mate did not come within sight or hearing.

At dawn this morning I resumed my watch at 5:50 a.m. The quail is so well screened by loose dead leaves that very little of her is visible in the nest, even with the electric torch.

6:09.—Now I first hear, off to my right, the subdued *caaa caaa caaa* of the male. He usually delivers this note three times, then pauses, then repeats it three times more; but occasionally he groups four calls together. He continues to call for several minutes while the female remains screened behind the leaves. Then she arises and pushes up the leaves in front of her as she moves forward. When half-way out she pauses, picks up one by one the leaves which have been screening her (some of which I placed there yesterday to conceal her the better from possible enemies) and tosses them backward on to the roof of the nest. She also throws back a few which she picks from the ground farther ahead. Then she walks slowly forward, and when several feet from the nest begins to voice her usual *witty witty*. She turns to her right, and among the undergrowth begins to call *caaa*, four times over, each note slightly higher than the last. The male appears from the undergrowth on my right, passes behind the blind scarcely a yard away, and walks toward her on my left. The area of bare red skin around his eyes is more extensive, and possibly brighter, than on his mate. He is followed by a third quail, who is more cautious and passes behind the blind at a considerably greater distance. The male joins his mate, and the third quail follows. They utter pleasant, murmurous, liquid notes as they go off together.

Going now to the nest, I find that all four eggs have been fractured over an area far more extensive than yesterday, but none has been pierced. The chicks within hammer vigorously and peep much.

8:32.—The female approaches the nest. As she comes within my range of vision in a clear space among the bushes, she picks up something from the ground and eats it, and afterwards wipes her bill several times from side to side upon the fallen leaves. Then she walks to the nest, voicing first the liquid *witty*, then the low *caaa* in rising sequence, as before. This is the first time I have heard her deliver the *caaa* as she returned to the nest. As she settles on the eggs, a second quail, who has followed her, passes behind the mound of earth at the base of which the nest is situated; while I hear the low calls of a third, probably her mate, farther off to the left. Then they cease, and the female is left alone

with her hatching eggs. Since she has removed the leaves which screened her, she is much more exposed as she sits.

To summarize what I learned about the rhythm of incubation, I found only the marked female on the nest, both during my longer vigils and on a number of brief visits. She sat continuously except for one long recess each morning. On four mornings, she left the nest at times ranging from 6:07 to 6:15 a.m. Her absences varied from 1 hour, 40 minutes (6:15 to 7:55) on February 7, to 3 hours, 3 minutes (6:07 to 9:10) on January 27. On four mornings she returned at 9:10, 7:55, 9:04 and 8:32. She generally left her nest by walking; after proceeding a few feet over the ground she might fly (possibly because she was confronted by the blind which was still unfamiliar to her), or she might continue to walk until out of sight of the blind (this was her usual way during my later vigils). As she walked from the nest she might pick fallen dead leaves from the ground and throw them back over her body, so that some fell upon the roof of the nest and others before the doorway. This usually added materially to the already good concealment of the nest, but sometimes had the opposite effect, for she threw farther back the leaves which had been screening the doorway. The male would come to call the female from the nest at about sunrise or a little before, and escort her on her return; but he always stopped short several yards away. Toward the end of the period of incubation, I noticed that the male on his visits to the vicinity of the nest was accompanied by a third wood-quail, whose relationship to himself and his mate was unknown. During much of the period of incubation, the business of chopping logs and ripping them into boards at a nearby scaffolding was continued; but the noise appeared not to upset the incubating quail.

The female wood-quail kept her eggs covered for from 75 to 86 per cent of the approximately twelve hours of daylight. This degree of assiduity in incubation is approached or even exceeded by some of the small birds whose separate sessions, rarely as long as an hour, alternate with frequent short recesses.

HATCHING AND DEPARTURE OF THE CHICKS

The long-watched-for event took place on February 13; on this morning I saw the wood-quail lead her chicks from the nest. When I arrived at ten minutes before six, while the light was still very dim beneath the trees, I found her sitting quietly, but with her head and foreparts far more exposed than yesterday morning, before she had removed the dead leaves which screened her, I entered the blind and quietly waited.

At five minutes past six I began to hear the low, subdued *caaa caaa caaa* of the male quail, who moved about somewhere off amid the undergrowth, where I could not see him. Since his mate in the nest neither moved nor answered, he continued his discreet calling for many minutes. Although I could tell by the voice and the sound of rustling leaves that he moved about beneath the bushes, he did not once reveal himself near the nest. While he called, and I strained my ears to detect an answering note, a Boat-billed Flycatcher in one of the trees above me persisted in voicing its long-drawn, disagreeable whining *churr*, which, to one with auditory faculties alert to catch other sounds, was most annoying.

After twenty minutes, the male quail's calls became less frequent; but he continued to move about in the undergrowth beyond my sight, and to call from time to time. At half past six the first level rays of the rising sun passed between the tree trunks and cast bright circles of light here and there upon the foliage in front of me. A Gray Thrush overhead proclaimed himself in triumphant song. The male quail began to call more frequently again. Soon he introduced into his calling a new note, that I had not heard before, a low, deep, *cahoo cahoo* which punctuated the more numerous *caas*. The fe-

male, who had remained quietly in the dark recess among the dead leaves, altogether invisible to me, now began to move slightly, and at times held her head in a position which revealed to me the bright orange-red skin around her eyes.

At forty minutes past six, after the male had been calling, and waiting patiently in concealment for a reply for a full thirty-five minutes, his mate at last gave him a sign of acknowledgement. She whispered a *caaa*, then murmured softly in a liquid voice. Her mate now became very much excited, and I could tell by the rustling of the dead fallen leaves that he moved more rapidly among the undergrowth. Then, for the first time, he revealed himself, and passed quickly behind the mound of earth, closely followed by the second quail, who accompanied him yesterday.

Now the female quail, with more low murmuring, rose and pushed half-way out of the nest. The chicks, which had escaped from the shell since her return to resume incubation yesterday morning, needed no urging to bring them from the nest. One pushed out beneath her while she paused in the doorway. She began to pick up dead leaves and even sticks from the ground in front of her and to toss them backward upon the roof of the nest. Then she stepped forth quite clear of the nest, and four downy chicks tumbled out around her. As she advanced, uttering her low, liquid *witty witty witty*, she continued to pick up dead leaves from in front of her and to toss them backward. She continued to toss back the leaves until she had advanced at least four feet from the nest, much farther than I had ever seen her do this before.

The chicks were tiny, chubby creatures, clad in soft down which was marked in a pattern of black and buff. The top of the head and back were black, or at least blackish, with a narrow white line along either side of the back, and the cheeks and sides of the neck were buff. I could not distinguish the pattern on their underparts. As their mother moved slowly forward uttering her liquid notes, they easily followed, although with an uneven, jerky movement compounded of short forward runs and brief pauses. The male, murmuring excitedly, advanced into the clear space to meet his family. The third quail took less interest in the proceedings.

The mother turned to her right and crossed a long, low, decaying log which lay before her. After a few ineffectual trials, three of the chicks managed to scramble up its sloping, uneven side, and dropped down to the clear, level ground beyond. But the last found difficulty in passing the barrier which blocked its advance, stretching for a long distance both to the right and the left. Apprised by the chick's weak peeps of its distress, the father returned to look after it, while the mother continued slowly forward with the other three. He stood upon the log, looking down, while the chick struggled along the barrier first to one side and then to the other, until at last it found a place where the irregularities in the decaying surface enabled it to scramble up and over. Then, following its father, it hurried after the rest of the family.

As they crossed a level area carpeted with dead leaves, the male quail scratched the litter aside and called to his chicks, but they did not attempt to pick anything up. All too soon they passed beyond my narrow circle of vision and were swallowed up by the dense undergrowth.

The period of incubation can be given only approximately. There were two eggs in the nest on January 14, four on January 19. If the eggs had been laid at daily intervals, the last was deposited not earlier than January 16. The four eggs hatched on February 12 or during the early hours of the morning of February 13. Accordingly the period of incubation was not less than 24 nor more than 28 days. That of the Bob-white is generally given as about 24 days.

After leaving the nest the downy young are led through the forest by their parents, often in company with the covey. I have on several occasions seen recently hatched

chicks travelling along with as many as five or six grown quails. When accompanied by young the adults are shy and it is difficult to watch them; but it seems likely that the little ones are aided in their search for food by the scratching of all the grown members of the flock. If a man approaches a group of quails accompanied by chicks, one of the adults remains behind, running back and forth through the undergrowth at no great distance from the intruder and seeming to try to draw attention to itself without incurring too much risk, while the others lead off the downy ones and quickly vanish amid the vegetation. Of if a chick lags behind or is cut off from the flock, usually a single adult will stay and try to lead it to safety, while the rest quickly walk out of sight with the other youngsters. This strategy usually works, and it is exceedingly difficult to catch the downy chicks. At times the conduct of the adults has told me plainly that they were accompanied by young; yet I have searched over the ground in vain for them; and all the while a grown bird has moved around just beyond reach, manifesting the greatest solicitude for the offspring I could not see. From the behavior of the pair which I watched as they led their downy brood from the nest, I believe that it is the female who walks off with the chicks, while the male lingers in the rear to distract the attention of hostile eyes and look after the laggards.

DISCOVERY OF THE THIRD NEST

With a record of two nests and one completed set of eggs of the wood-quail discovered during ten seasons, it did not seem likely that I should soon find another. But soon after this paper was sent off for publication, the unexpected happened and I encountered my third nest. I was led to the discovery of this nest by recalling certain facts that I had learned in my study of the first nest.

I passed the morning of June 3, 1947, in a blind watching a nest of the Tyrannine Antbird (*Cercomacra tyrannina*) in which both members of the pair were incubating their two eggs. This was on a low ridge in the forest, but close by its edge where it bordered a fallow field devoted to animal crops and now overgrown with tall weeds, bushes and vines. At about 6:45 I noticed three grown quails resting on a slender horizontal dead trunk about a yard above the ground, down the steep slope to my right and between me and the forest's edge. Intervening foliage prevented a complete view of them, but I could see that they were moving around a good deal and apparently preening. One sang snatches of the *burst the bubble* song. Then they walked up the steep incline toward me, going single file and scratching here and there with their feet. They passed within a yard of me, then almost directly beneath the antbirds' nest, but without disturbing the blackish male antbird which was sitting in the swinging pouch less than two feet above them. After passing out of sight they sang again and were answered by other wood-quails farther off in the forest. At 8:30 the three quails returned from the direction in which they had disappeared about an hour and three-quarters earlier, walking single file close behind the blind. One raised its long crest quizzically as they passed me. They continued down the slope toward the point where I had first seen them on the trunk and vanished amid the undergrowth.

The return of these quails to what appeared to be a definite point near the forest's edge, and the hour of their going and coming, suggested the presence of a nest. I surmised that one of the trio was incubating, while the other two had gone to call her from her eggs at about sunrise and to escort her back to them later in the morning, just as had been the custom at the nest I had studied more than ten years earlier. In the afternoon of the same day I searched for the quail's nest amid the entangled vegetation on the steep slope that led down to the forest's edge. For about an hour I worked laboriously through the bushes and vines, drifting farther and farther from the point where

I had first seen the quails but where no nest was found. My search led me beneath a huge fig tree, whose trunk at a height of about thirty feet began to divide into a number of separate twisted columns, some of which stood out from the main mass like the flying buttresses of a Gothic cathedral, so that I had ample space to pass between them. Where the partial trunks met the ground they sent out great roots that formed irregular ridges of wood rising a foot or so above the leaf-strewn surface. While I was engaged, not without unpleasant thoughts of lurking snakes, in hunting for the quail's nest in the cavern-like base of the fig-tree trunk and between the woody ridges of the roots, a dog came running up, and with a whirl of wings the quail rose up almost under her nose, but behind me! I had passed in front of her nest at a distance of less than two yards without noticing it and without causing the bird to flee.

Brown dead leaves had drifted deeply into the narrow, sloping space between two great protruding roots of the fig-tree. Into the mass of leaves a cavity extended obliquely downward for a distance of nine inches. Round in cross-section, the tubular hollow measured about $5\frac{1}{4}$ inches in diameter. There was a slight lining of finer leaves in the bottom; but apparently the quail had done very little nest-building and had merely burrowed down into the accumulated leaves and perhaps carried in a few pieces of finer leaves to line the bottom. The interior of the nest was warm and dry in spite of the rain which had fallen in the morning and soaked all the ground litter of the forest. Here lay four unmarked white eggs, slightly stained from contact with the leaves, and so well hidden in their deep nook that one might pass by them a hundred times without suspecting their presence. They measured 38.9 by 27.8, 38.1 by 28.6, 38.1 by 27.8 and 37.3 by 27.8 millimeters.

The departure and return of the wood-quails by almost the same route suggested that they might have a definite path for leaving and going back to the nest. To investigate this point, I spent the early part of the following morning in the blind, watching the antbirds and keeping a lookout for the quails. But I neither saw nor heard the latter. On ending my vigil at 9:45, I went directly to the quail's nest and found her sitting, doubtless having already taken her morning's outing with her two companions, but going and coming by a route distinct from that they had followed on the preceding morning. As I drew near, she shrank back farther into the nest, making herself very inconspicuous in her nook beneath the leaves; and I went away without disturbing her. On the next day, June 5, the quail was absent and the eggs cold at 8:10 a.m. A big yellow leaf covered and concealed the doorway of the nest, and I wondered whether it had been placed there by the bird herself. Returning at nine o'clock, I found her sitting beneath the leaf and almost invisible in her cavity. At 1:15 p.m. on June 5 and 11:05 a.m. on June 6 I also found the quail sitting beneath the concealing leaf and did not disturb her. At 7 a.m. on June 7 I found the nest destroyed. The leaves that had formed its walls and roof were scattered among the surrounding dead leaves and could not be distinguished from them, with the result that the nest was quite unrecognizable. Fragments of shell scattered around pointed to a mammal rather than a snake—which would have swallowed the eggs whole—as the predator. There were no feathers, whence I inferred that the quail had escaped unharmed.

SUMMARY

In the basin of El General in southern Costa Rica, Chiriquí Marbled Wood-Quails dwell on the ground beneath heavy rain-forest, whence they venture forth into adjacent areas of tall secondary woods and at times into shady plantations.

They travel in coveys of eight individuals or fewer, usually walking in single file. No indication of the existence of "peck-order" or "dominance" has been observed. Mem-

bers of the covey hunt food in closest co-operation and preen each other's plumage, especially on the head and abdomen.

The wood-quail's vocabulary is richly varied. Members of the covey constantly utter low, soft notes as they forage together. The beautiful, loud, rapid song, most often delivered in the evening twilight, is apparently produced by the male and female singing alternately with perfect timing.

Three nests were found during a decade. All three were well-enclosed chambers, roofed with dead leaves, twigs, grasses and the like, with a round doorway in the side. They were situated on sloping ground, or at the base of a mound in the woods, or in the narrow space between protruding roots of a fig tree.

Eggs were laid in these nests in January, April, and probably May; the April set was lost, apparently before completion. The other two sets consisted of four white, unmarked eggs.

At the January nest the sitting bird was marked with paint; and throughout the study only this individual, without much doubt the female, was seen on the eggs. She sat continuously except for one long recess each day. This began every morning at very nearly the same time, soon after six o'clock, and lasted from 1 hour, 40 minutes to a little over 3 hours.

As the female quail walked from the nest to take her recess, she would sometimes pick dead leaves from the ground in front of her and toss them over her back, so that some fell on the roof of the nest and others in front of the doorway. This procedure usually resulted in increasing the already excellent concealment of the nest and the sitting bird; but sometimes it had the opposite effect, for it removed the leaves that screened the doorway.

Each morning a little after six o'clock the male would come and call his mate from the nest, and at the end of her outing he would escort her back to its vicinity. But he regularly stopped short several yards from the nest. Toward the end of the incubation period the male was accompanied by a third grown quail, whose relationship to the mated pair remained unknown.

The female quail led the chicks from the nest when they were less than 22 hours old. She made her final exit about half an hour later than her customary time for beginning her recess when she incubated.

On the morning the chicks left, the male came at his customary hour but remained out of sight amid the undergrowth, repeatedly calling, until the female began to move from the nest. Then he advanced to meet the family and looked after a laggard chick, while the female led away the other three. The third grown bird was present but showed less interest in the proceedings.

The period of incubation at this nest was between 24 and 28 days.

Downy chicks have been seen travelling with coveys of five or six grown quails.

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LITERATURE CITED

- Carriker, M. A., Jr.
1910. An annotated list of the birds of Costa Rica including Cocos Island. *Ann. Carnegie Mus.*, 6:314-915.
- Chapman, F. M.
1929. *My tropical air castle* (New York, D. Appleton and Co.), xvi + 417 pp.
- Dobie, J. F.
1945. Strange animal friendships. *Nature Magazine*, 38:9-12.

Nice, M. M.

1943. Studies in the life history of the Song Sparrow II. Trans. Linn. Soc. N. Y., 6:i-viii + 1-328.

Schneirla, T. C.

1946. Problems in the biopsychology of social organization. Jour. Abnorm. Social Psych., 41: 385-402.

Skutch, A. F.

1935. Helpers at the nest. Auk, 52:257-273.

1940. Social and sleeping habits of Central American wrens. Auk, 57:293-312.

1943. The family life of Central American woodpeckers. Scientific Monthly, 56:358-364.

Sturgis, B. B.

1928. Field book of birds of the Panama Canal Zone (New York, G. P. Putnam's Sons), xlii + 466 pp.

Finca "Los Cusingos," San Isidro del General, Costa Rica, April 25, 1947.

WINTER FOOD OF WHITE-TAILED PTARMIGAN IN COLORADO

By H. F. QUICK

The Southern White-tailed Ptarmigan, *Lagopus leucurus altipetens*, was observed in Colorado by the writer in the years 1941 to 1947. Observations were made on various occasions in the Sawatch Range of Gunnison County, the Ten Mile and Williams ranges of Eagle and Pitkin counties, the vicinity of Berthoud Pass, and in Rocky Mountain National Park. Ptarmigan were seen in all seasons of the year, but this report relates to the winter season when observation is simplified by readable signs of activity in the snow.

In the winter in this region, deep snow limits the available food to a few species of plants. Most abundant are the various willows and alpine fir, some alder, little bog birch, Englemann spruce and limber pine. On wind-swept rock fields lichens, mosses and withered alpine plants are available. Here, too, ptarmigan find grit in the little basins of weathered rock between boulders.

It was noted that the largest flocks of birds were found in high alpine basins where willows were abundant. Ptarmigan appeared in flocks of five to thirty in these basins. Occasionally single birds were found in alpine conifer types such as dwarfed alpine fir, sometimes called "shinnery" or "shintangle," and in stunted limber pine stands at timber line. Birds were sometimes seen on high-angled rock slopes which are generally bare of snow. When flushed from this habitat, ptarmigan would usually dive off in fast flight for the snow basins lying below. Sometimes, when the observer was climbing, birds would be flushed at the tip of an approaching ski from hiding places under the snow. The birds would burst from concealment in a puff of powder snow and hurtle off 30 or 40 yards to drop duck-like into the snow and hiding. Flights of half a mile have been witnessed. On one occasion in Rocky Mountain National Park, a flock of about 25 birds flew up-mountain directly across a wind of gale proportion. The flight power of ptarmigan seems to be as strong as that of some of the other members of its family, although at times their hesitancy to fly might belie this ability.

After a few periods of observation the writer noted considerable browsing of ptarmigan by tracking the birds. Signs in the snow made interpretation rather easy. Ptarmigan not only take the buds of willow but also nip off whole twigs as large as 15 mm. long and 2 mm. in diameter. The occurrence of twig stubs with shreds of bark torn down the stem suggested a plot method of food habits study similar to that used for investigations of big-game food habits. Several trial plots of one square foot each were marked at random and the availability of vegetation rated. Then a count of the browsed twigs was made as an index of use. One plot with an availability of approximately 150 twigs was browsed 40 times, or 26.6 per cent. On this particular plot, only willow occurred. This method was used only as a trial and is mentioned as an aid to further study. The changing snow level creates a varying availability by alternately covering and exposing different levels of vegetation; this factor would require consideration in such a study.

The method used in this report was mainly the analysis of droppings. Over 500 droppings were collected off the surface of the snow and from roosting holes in the snow. Usually six to ten droppings would be found in a roosting hole. Droppings were easily collected off the snow surface among the willows which the birds seem to favor.

Of the collections made, 145 droppings were weighed and measured separately, the remainder being weighed and analyzed in bulk. All samples were first oven dried. The

measurements taken were length and maximum diameter in millimeters. These measurements were taken to aid in identification, since the local ranges of blue grouse and ptarmigan sometimes overlap. Analyses were made by soaking and disintegrating specimens in a watch glass and by the use of binocular dissecting microscope and compound microscope. The laboratory work was done at Colorado State College, in the Division of Forestry and Range Management, where herbarium specimens from the region were available for comparison.

Table 1 condenses the dimensions of the droppings which were measured individually. In general, a considerable difference in the size of blue grouse and ptarmigan droppings occurs, those of ptarmigan being much the smaller. Piles of droppings of both species are frequently found on snow banks but are readily distinguishable after a little study.

Table 1
Weights and Measurements of 145 Ptarmigan Droppings

	Maximum	Minimum	Average
Length	30 mm.	13 mm.	24.3 mm.
Diameter	7 mm.	4 mm.	6.1 mm.
Weight	0.25 gm.	0.10 gm.	0.177 gm.

Table 2 shows a series of selected samples which indicate the general character of the contents of all the samples. Willows constitute most of the winter food of ptarmigan in the area considered. Most droppings consisted of a finely ground mass of willow twigs

Table 2
Contents of Ptarmigan Droppings

Sample	Number of droppings	Weight of sample: gms., oven dried	Contents by per cent of total volume		
			Willow	Fir	Grit
1	6	.65	95.0	5.0	trace
2	17	1.72	90.0	10.0	trace
3	5	.89	90.0	8.0	2.0
4	10	1.40	90.0	10.0	trace
5	10	1.30	90.0	10.0	none
6	3	.30	100.0	0.0	none
7	2	.30	100.0	0.0	trace
8	20	3.70	90.0	5.0	5.0
9	33	9.50	87.0	10.0	3.0
10	20	3.70	90.0	5.0	5.0

and buds. A branched twig 6 mm. long and 2 mm. thick with a bud attached was found in a dropping. In this same individual dropping an entire needle of an alpine fir was found. Apparently both escaped grinding in the gizzard. Many droppings contained shreds of wood fibre which approximated 15 mm. in length. These could be identified only as a species of "hardwood, likely willow." Bud scales were numerous. Although macerated, they were identifiable.

Grit in the ptarmigan diet is probably very essential. The nature of the food of this bird is tough and fibrous and would seem to require considerable grinding. The occurrence of grit in individual ptarmigan droppings varied from zero to as much as 25 per cent by volume. Pure angular white quartz grit was most commonly found. Particles of granite and feldspars occurred in lesser amounts. The maximum dimension of the largest grit found was 5 mm., a piece of white quartz. The greatest quantity of grit by weight was 0.9 grams of a total weight of 3.7 grams, or 24.3 per cent by dry weight obtained

from a single series of 20 droppings. In a series of 33 droppings, there were 1.1 grams of grit in a total oven-dry weight of 9.5 grams. This amount of grit was 11.6 per cent by weight of the sample and 3 per cent by volume.

SUMMARY

The winter food of White-tailed Ptarmigan in the southern Rocky Mountain region consists chiefly of the buds and woody twigs of the various species of alpine willows. Needles of the alpine fir are eaten by ptarmigan but to a lesser extent than willow buds and twigs. Ptarmigan obtain grit from the wind-swept boulder fields but prefer to roost and browse in protected basins where willows are abundant.

Colorado Agricultural and Mechanical College, Fort Collins, Colorado, August 10, 1947.

A TEN-YEAR RECORD OF BIRD OCCURRENCE ON THE HASTINGS RESERVATION

By JEAN M. LINSDALE

The Frances Simes Hastings Natural History Reservation is a 1600-acre tract in the northern Santa Lucia Mountains, in Monterey County, California. As a part of the plan to study continuously the biology of an undisturbed area, numerous persons have made observations on birds in the interval from October, 1937, to May, 1947. In this condensed summary the status is indicated for each of the 139 species so far recorded. The birds are discussed in three groups: 48 kinds that live on the area for their complete life cycle; 52 kinds that live here regularly but are unable to complete their life cycle; 39 kinds that are unable to live on the Reservation or to stay for long if they do come.

The five birds that we see most frequently are the California jay, spotted towhee, brown towhee, plain titmouse, and Oregon junco and each has been recorded on more than 97 per cent of the days in the field. A person who knows these birds knows the types of woodland and brushland inhabited by the characteristically upper foothill birds in California. Next on the list, in order of frequency of observation, is the crow, a few being present nearly every day. Up to 6 pairs nest on the area and wintering flocks may number 200. The number of linnets, the period of their stay each year, and the amount of ground occupied were considerably restricted by the natural changes which took place in the vegetation after 1937. Yellow-billed magpies have more than doubled in the ten years; as many as 200 come to roost in the winter. Numbers of California woodpeckers have fluctuated with differing acorn crops, but the occurrence of oaks makes it possible to be within hearing of the birds at almost any spot on the Reservation. Reduction of California quail which came with the increased density of ground cover has changed to an increase with the recent dry years. The winter influx of red-shafted flickers is reduced to fewer than 10 nesting pairs by spring.

The 7 to 10 pairs of black phoebes about buildings and bridges are reduced to one or two birds in severe winters and sometimes none is left for short periods. Except for possible reduction in the severest winters the wren-tit maintains high numbers over more than half the area. The western bluebird is the only member of the thrush family with complete life cycle on the Reservation and we see it on 9 out of 10 days spent in the field. The total white-breasted nuthatch population is not high, and sometimes it is difficult to find a single bird among the lone oaks, in parkland, or in the closed woods where it lives. In the early months of our stay the open ground was so nearly bare that we saw no meadowlarks, but as soon as sufficient grass was present this bird became a conspicuous resident. The green-backed goldfinch seems better adapted to the natural conditions of the region than many of the seed-eating birds, for it was less affected by the changes which came after farming was stopped. The Lawrence goldfinch occurs along with the green-backed, but it exhibits greater irregularity in presence and greater fluctuations in numbers.

At least one colony of lark sparrows has remained resident, but there are indications that these birds are being crowded out by the accumulating cover of plants. Characteristic of the streamside bushes, the California thrasher seemed to increase gradually through at least the early part of the ten-year period. We have seen Nuttall woodpeckers regularly among the streamside bushes, in parkland, and in closed woods, and we have

encountered the species about 4 times as often as the hairy and about 7 times as often as the downy.

We have designated the mourning dove as resident with complete life cycle although its numbers were small in winter and recently none stayed through winter, the reduction paralleling the increased density of low plant cover. Area occupied and total numbers of the purple finch are least in the nesting season and greatest in the fall when wild fruits are most widely available. In early years the normally resident bush-tit was scarce, probably as a result of starving in the severe winter of 1936-37, but a gradual increase brought the species to a high rank implied by its special affinity for live oaks. Two or 3 pairs of the sparrow hawk have nested on the area or close beside the boundary, but recovery of the vegetation apparently makes the land less favorable for it, and in later years the bird has been present less continually. Restriction of the Steller jay to the small extent of closed woods makes the total number on the Reservation small. The Anna hummingbird usually is considered non-migratory, but here none is found in severe parts of winter and nearly all individuals leave when cool fall weather comes. The Bewick wren is regularly present, inconspicuous and close to cover, in dense bushes, streamside bushes, lone trees, parkland, and closed woods. The one or two nesting pairs of red-tailed hawks and their young as well as individuals which range onto the tract make the sight of one nearly a daily occurrence except in the most severe weather of winter. Close restriction of song sparrows to streamside bushes and more open sections of the streams limits the habitat to less than 2 miles of intermittent creek bed where numbers rose as the vegetation increased after grazing stopped and then decreased when the streams remained dry for year-long intervals; in any year fewer were present in winter than summer.

In some years the chipping sparrow is resident with complete life cycle on the area, but in every winter there has been a period when none was seen; it is present regularly in small numbers from mid-April to mid-September. The sharp-shinned hawk nests here some years, but it is most numerous as a transient in the fall. Hutton vireos increased to occupy the whole live oak woodland after depletion in the severe winter of 1936-37. Usually a pair, sometimes a single bird and sometimes three, barn owls have lived almost continuously in an unused barn but successful broods seldom matured. Several pairs, possibly 4 or 5, of the horned owl reside on the area. The Cooper hawk is usually present through the year, but it is likely that the nesting pairs are replaced at other seasons by transients. Screech owls are more numerous and widespread through the year in the parkland and closed woods than any other owl. Mountain quail have increased in numbers through the 10 years, but they remain restricted to the more heavily wooded portions of the area. The Bell sparrow is closely restricted to sparse and dense bushes and is not seen unless special search is made for it. Road-runners, one to 4 birds at a time, have been seen in each month except November and December on bare ground, and in low grass, sparse bushes, and parkland with records most numerous in the spring and in the driest years. Both the brown creeper and chestnut-backed chickadee are represented by one or two nesting pairs in the moister woods and along the more heavily shaded canyons. The latter species was not found for two full years after the cold and stormy 1936-37 winter. A few rufous-crowned sparrows live in sparse bushes, dense bushes, and streamside bushes and they keep close within the cover provided by the low plants in these situations. The pigmy owl has so increased in the woodland that individuals are heard on almost every day in the field. Several broods of the saw-whet owl were reared successfully in the summer of 1940, but we have not since then detected the species. A resident pair of dippers occupied about a mile of creek length on the Reservation from 1942 until the recent drouth caused the stream to become intermittent.

This concludes the list of 48 birds which so far have demonstrated a capacity to

find all the requirements for a complete life cycle on the tract. Not all of them are able to stay through the whole year or to stay every year, but they are able to live in some years on the kind of land represented. The varying numbers and differing habitats occupied show further characteristics in response to the land.

Another group of 52 birds lives regularly on the Reservation, but none is able to complete its life cycle there. Because this group includes birds resident in the near vicinity, nesters on the area, winter visitants, and transients all represented by highly variable numbers in different years, the arrangement is in systematic order. One or more turkey vultures fly across the area regularly through the summer from mid-March to August or September; extreme dates being February 22 and October 16. The nearest nesting site of the golden eagle is about a mile outside the Reservation; members of at least two pairs came regularly to hunt when ground squirrels were still plentiful. More than 60 occurrences of the marsh hawk, a casual visitor, have represented all the months but May and August with peaks in January and November. Among 19 brief occurrences of prairie falcons, all but one of single birds, all the months were represented but January and April. One or two duck hawks were recorded on 5 February dates, once in June, twice in September. The pigeon hawk was seen in the parkland on 13 dates between September 26 (1940) and April 6 (1938). Small numbers of the killdeer make exploratory or migratory flights over the Reservation through the year, for records cover every month but June and July. The band-tailed pigeon is winter visitant on the Reservation, although a few nest in the region. Here the bulk of the birds come in October and November, with extreme dates July 4 and May 28 except for a record on June 8, 1945. The summer resident poor-will has been detected in every month but December and January. The birds have been heard on bare ground, among sparse bushes, and in parkland from February 16 (1946) to November 30 (1937). Earliest and latest dates for the summer resident black-chinned hummingbird are March 18 (1946) and September 24 (1945). All other spring records are after mid-April. The Allen hummingbird is present as a nester from March to July; March 28 (1944) and July 31 (1944) being extreme dates. The belted kingfisher has been resident although with incomplete life cycle on the Reservation, for the birds which come have nesting sites down the stream below the area. The occurrences are distributed through the year, with the greatest number in September. In the large wintering population of flickers there are many hybrids and the gross appearance of a few indicates they belong to the yellow-shafted species. Records show presence between October 21 and February 6. A few winter red-breasted sapsuckers occur among dense bushes, streamside bushes, parkland, and closed woods between September 23 (1946) and April 16 (1940).

One or two nesting pairs of Arkansas kingbirds inhabit lone trees and parkland in the vicinity of buildings through the early summer, extreme dates: March 28 (1947) and July 23 (1945). The ash-throated flycatcher is a regular nester in the parkland, coming as early as April 10 (1938) and remaining as late as August 24 (1942). One or two winter visitant Say phoebes are seen each winter over low grass, tall grass, sparse bushes, among lone trees, in parkland, and about buildings from September 12 (1942) to March 25 (1939), with 2 other dates on May 23, 1938, and August 20, 1943. The summer resident western flycatcher occupies the streamside bushes, closed woods, and vicinity of buildings for as much as 6 months of the year, extreme dates being March 11 (1941) and October 5 (1939). Another flycatcher, the wood pewee, lives for less than 5 months of the summer in the streamside bushes, parkland, and closed woods with seasonal limits between April 15 (1942) and September 18 (1939). Records of the olive-sided flycatcher extend from April 9 (1939) to August 21 (1946) with the few individuals staying only long enough to complete their nesting.

Extreme dates for the violet-green swallow are February 17 (1938) and October 3 (1942), but this is a much longer interval than most of the nesters stay here. They are seen in the air and among lone trees and parkland. Cliff swallows at first nested in small numbers, but after 1941 their annual stay became shorter, and in some years there was only one record, obviously of summer stragglers. Extreme dates are April 3 (1939) and August 9 (1938). Cavities in lone valley oaks on flats and hilltops were occupied by a few pairs of nesting purple martins whose stay extended from as early as March 30 (1942) to September 25 (1946). House wrens have normally been summer residents from late March to August or September, with stragglers present in some years as late as December 1 (1937) and 15 (1939) and one record for January 4 (1939). Robins are regularly winter visitants, sometimes in large numbers, in the period ranging from September 28 (1942) to May 13 (1941) with the last normally sometime in April, once as early as February 3 (1943) and one in summer on July 21 (1944). The varied thrush is present in winter, sometimes numerous and sometimes scarce, in the period between October 27 (1937) and April 15 (1945). Winter visitant hermit thrushes have been seen between September 26 (1945) and April 21 (1938 and 1945), but a young bird that could not have traveled many miles from the nest, seen on July 12, 1943, was a reminder that the species nests in the region. The russet-backed thrush is summer resident but we have not yet established that it nests within the Reservation boundaries. The 36 occurrences were between April 22 and September 14 and nearly half of them were in May.

Blue-gray gnatcatchers are characteristic summer residents with incomplete life cycle in the parkland, with extreme dates of occurrence between February 28 (1938) and September 28 (1938). From the last week of September (17th in 1945) to the last week of April (27th in 1938) we expect to see the ruby-crowned kinglet daily in dense bushes, streamside bushes, parkland, and closed woods. Pipits were winter visitant until 1940 when the bare ground which attracted them became covered with vegetation so tall as to prevent their further use of the area. Seasons of occurrence extended from November 7 to March 1. Cedar waxwings, as winter visitants, have been present each winter in lone trees, parkland, and closed woods with records coming between September 19 and May 30. From July 1, 1939 to March 1, 1940, one or two loggerhead shrikes lived on or close to the Reservation continuously. One other individual was seen on August 26, 1942. The summer resident solitary vireo is restricted to the closed woods, and extreme seasonal dates for it have been March 18 (1946) and October 2 (1946). The warbling vireo differs from the solitary by arriving earlier, March 15 (1941 and 1947) and staying later, September 27 (1938), by occupying a greater variety of habitat (streamside bushes, parkland, and closed woods), and by being present in greater numbers.

The summer resident orange-crowned warbler comes close to being present through the year, for individuals have been seen as early as February 27 (1938) and as late as November 5 (1938), but these extremes are not necessarily members of the nesting race. Early and late dates for yellow warblers are April 13 (1944) and October 8 (1940); the fall birds seem to be transients. Winter records of myrtle warblers are between October 28 (1946) and April 27 (1939). Winter records of Audubon warblers are between September 21 (1939) and April 20 (1947). The species nests within 2 miles of the boundary but apparently these summer birds do not regularly come to the Reservation, even though a single bird was seen there once, on June 27, 1940. We consider the black-throated gray warbler a summer resident although records have been made in every month but January. The occurrences are between February 5 (1938) and December 24 (1940) with the bulk of them from April to August, and the birds are usually in parkland

and closed woods. Townsend warblers are winter visitant and occur, usually singly, in the closed woods from August to April. One or two nesting pairs of Tolmie warblers have lived in dense bushes or streamside bushes in the interval between April 6 and September 20. Yellow-breasted chats are sparse transients; usually only one bird is seen in one day. In spring 11 records in 7 years were between April 22 and May 19. In the fall one bird was present for nearly a week in mid-August and another was seen on September 21 (1944). Pileolated warblers are transient on the Reservation, but the species nests in the vicinity, for we have seen the birds in every month from March to November with peaks in April and September and extremes March 15 (1941) and November 1 (1939).

The Bullock oriole in summer inhabits lone trees and parkland and forms colonies which nest in the trees about groups of buildings. Extreme dates of occurrence are March 17 (1947) and September 4 (1942), but the birds usually arrive in the last week of March and leave by the end of July. Extreme dates for the summer resident black-headed grosbeak are March 29 (1940) and October 10 (1945). The summer resident lazuli bunting has come as early as April 15 (1940) and stayed as late as September 11 (1939). The first increase in population was followed by a marked decrease in later years. Winter visitant savannah sparrows have been present regularly and in increasing numbers each year from mid-September to the end of April. The wintering white-crowned sparrows arrive in mid-September (9 dates between 13th and 23d) and leave in late April or early May, the latest being May 11 (1938). The earliest arrival date for the golden-crowned sparrow is September 20 (1946), and the latest spring date is May 17 (1944). Wintering fox sparrows have never been numerous; presence has been between September 26 and May 1. Small numbers of Lincoln sparrows have been recorded from September 9 (1943) to May 6 (1942) with the greatest number of records in April.

A third group of birds includes kinds which are unable to live on the Reservation or to stay for long if they do happen to come there. The environment is not suited for any appreciable segment of their life cycles and their presence here is really accidental. These 34 species invite a different kind of interest than the two groups just discussed.

A common loon was seen in flight twice on the morning of December 11, 1937. On April 15, 1941, a Pacific loon was in a small creek apparently forced down from a large flight over land. A great blue heron flew over the area on August 15, 1946. Single green herons were found in willow thickets on May 29, 1939, and July 23, 1942. A small flock of pintail flew across the Reservation on August 18, 1939, and it or a similar flock was seen flying in the opposite direction 24 hours later; another group of 15 in flight was seen on November 3, 1944. White-tailed kites have been seen 4 times, January 20, 1938, April 28, 1946, May 3, 1943, and May 2 to 21, 1947, usually over sites of meadow mouse colonies. A red-bellied hawk was present for several days in mid-March, 1939. An osprey was seen once, on April 21, 1938. A Wilson snipe was found on November 2, 1938, and one settled to the ground beside a house in a snowstorm on the night of February 2, 1946. At least two long-eared owls lived on the area part of the time until June, 1940. The sixteen records in three years were for dates between February 22 and June 18. North-bound migrant Vaux swifts have been seen on 5 dates between April 22 and May 19, usually as single birds, but once as many as 12 together. White-throated swifts reside within a few miles but not near enough to cross the area regularly. Groups or lone birds in flight have been seen in January, February, May, June and September. Rufous hummingbirds have been observed from March 31 (1939) to April 15 (1938) and on July 23 (1942). Lewis woodpeckers are casual on the Reservation and accidental with respect to life cycle. The largest number of records has been in October and seasonal limits have been September 22 (1940) and May 16 (1942).

A Cassin kingbird was on the area on November 6, 1944. In April and May of each year and again in August and September a few Traill flycatchers have been in the thickets along the streams, but apparently none was present for more than a few days. Horned larks were detected on 26 days from November 6, 1937, to January 22, 1938, always on nearly bare sandy hilltops, but with the increase in vegetation there was no ground suitable for the species. A pair of rough-winged swallows flew about over the Reservation boundary for a few minutes on the morning of April 12, 1943. A barn swallow was seen in flight on the morning of May 10, 1938. A transient red-breasted nuthatch was watched for about 2 minutes on November 27, 1937. Winter wrens have been seen from October 2 to November 25 with one on April 14, 1945, usually in streamside bushes or closed woods. A canyon wren was present about buildings on 4 dates in August, 1942, and on August 2, 1944; one was on a rocky slope in woodland on October 15, 1942. Thirteen occurrences of mockingbirds on dates between October 3 and March 9 in 5 winters represented about 8 birds and all were seen in an area less than an eighth of a mile across. Golden-crowned kinglets might be expected to occur on the area more often than they have been seen; five birds were seen together on November 16, 1938, and a considerable number spent the winter of 1944-45 here when exceptional numbers were present in the region. Vagrant phainopeplas were detected 4 times in 3 years; on February 22, 1939, April 23, 1946, August 13, 1939, and November 25, 1937. Four times in April of 3 different years single Nashville warblers were recorded. Hermit warblers have been seen 3 times in late April and once toward the end of September. Four definite records of yellow-throats are for March 24 (1946) and 27 (1945) and April 11 (1940) and 15 (1946). House sparrows, singly or in pairs have been present for short periods in March (1940) and April (1939 and 1946). Dates of exploratory appearance of single male red-winged blackbirds were April 14 and May 2, 1939, and April 5, 1940. In early years from October to February flocks of tricolor redwings frequently visited or crossed over the narrowest part of the Reservation, usually with Brewer blackbirds. The latter are likely to be seen any day of the year for the nearest nesting colony is about two miles away and individuals, pairs, or flocks, frequently cross the area although they seldom stop. The western tanager is the most conspicuous of the strictly transient birds on the Reservation. The migration period is long, extending from mid-April to late May and from mid-July to mid-October. A blue grosbeak was present on August 31, 1938. The winter visitant pine siskin and the American goldfinch were seen frequently in the first year but rarely or not at all in subsequent years. Single black-chinned sparrows have been seen only twice, on June 8, 1938, and August 30, 1939, even though the species nests regularly in the neighborhood. A Harris sparrow was banded on November 19, 1944. White-throated sparrows have been recorded in 9 winters, on dates as early as October 16 (1940) and as late as April 18 (1947).

The observations here summarized tend to emphasize the specific response each kind of bird makes to the environment. This response may permit the bird to maintain a small or large population in the area from year to year, as the first group demonstrates. Or it may permit the bird to spend some major segment of its life there, as is shown by the second group. Still a third group contains birds able to reach the area, but unable to establish themselves there, even for a short time. No sharp break separates the groups and many species may be transferred from one to another. In so short a time as 10 years numerous species have changed from one group to another, usually as conditions on the land changed, but sometimes in response to changes in conditions elsewhere.

Hastings Reservation, Monterey, California, May 20, 1947.

THE BANDED WRENS OF NORTHERN MIDDLE AMERICA

By PIERCE BRODKORB

The wrens of the genus *Campylorhynchus* (formerly *Heleodytes*) are prominent members of the Mexican and Central American avifauna. Of large size, noisy habits, and bold disposition, they attract the attention of the observer. The genus as a whole occupies a wide area geographically and a variety of habitats, from desert to dripping cloud forest, and from the seacoast to high in the mountains. Speciation has taken place to a rather marked degree, since Mexico alone has about 8 full species and about 20 forms. In spite of the abundance of a given form, its distribution is likely to be restricted to rather narrow limits, defined more often than not by the ranges of its congeners.

The species treated here, *Campylorhynchus zonatus*, has a geographical distribution from central Mexico to Ecuador, and an altitudinal range from sea level to 2400 meters elevation. Only the populations inhabiting the northern part of this range, from Nicaragua northward, will be discussed here. In the mountains it occurs in the zone below that occupied by *C. megalopterus*. In the lowlands it is replaced by *C. rufinucha*, *C. chiapensis*, *C. capistratus*, and *C. yucatanicus*. Where no other members of the genus occur in the lowlands, it reaches the coast, as it does in Tabasco and extreme southern Veracruz.

Hellmayr in 1934 recognized no subspecies in the area under consideration. However, a study of the specimens belonging to the Academy of Natural Sciences of Philadelphia, the United States National Museum, and the University of Michigan Museum of Zoology, including the types or topotypes of all the named forms, indicates that the species varies geographically. At the mouth of the Río Usumacinta this wren is large, dark, and heavily marked. To the north its size decreases, its coloration becomes paler, and its markings become less prominent. South of the Usumacinta River the same general trends of small size, pale coloration, and more nearly immaculate pattern are even more pronounced.

According to my views three subspecies of *zonatus* are recognizable in this area. Other variations seem to be too unstable for nomenclatorial separation.

Campylorhynchus zonatus zonatus (Lesson)

Picolaptes zonatus Lesson, Cent. Zool., livr. 14 (1830=March, 1831?): 210, pl. 70 ("cet oiseau habite la Californie"; I substitute as type locality the town of Orizaba, Veracruz).

Campylorhynchus nigriceps Sclater, Proc. Zool. Soc. Lond., 1860, p. 461 (Orizaba and Jalapa, Veracruz; juv.).

Characters.—Size small (see table 1); ground color of flanks and crissum pale, marked with small spots; abdomen unspotted.

Range.—Coffee zone of extreme northern Puebla (Metlatoyuca) and northern Veracruz (from Papantla to Motzorongo). Above 1500 meters altitude it is replaced by *Campylorhynchus megalopterus*, below 500 meters by *C. rufinucha rufinucha*.

Specimens examined.—Puebla (Metlatoyuca, 3). Veracruz (Papantla, 4; Jalapa, 1; Mirador, 6; Orizaba, 2; near Fortín, 2; Potrero Viejo, 1; Motzorongo, 4).

Campylorhynchus zonatus restrictus (Nelson)

Heleodytes zonatus restrictus Nelson, Auk, 18, No. 1 (Jan., 1901): 49 (Frontera, Tabasco).

Heleodytes zonatus impudens Bangs and Peters, Bull. Mus. Comp. Zool., 68, No. 8 (Oct., 1928): 398 (Chivela, Oaxaca).

Characters.—Size large; coloration of under parts rich; spots on under parts large and tending to form bars, the entire ventral surface usually covered with marks, even on the center of the abdomen, under wing coverts, axillars, and thighs.

Range.—Lowlands and coffee zone of southern Veracruz (northwest to San Andrés Tuxtla), northern Oaxaca, Tabasco, southern Campeche, British Honduras, and northern Guatemala.

Heleodytes zonatus impudens Bangs and Peters appears to be a synonym. Birds from Oaxaca, southern Veracruz, and western Tabasco, do not differ in size from *restrictus*, although they are on the

average a little less heavily marked. This tendency indicates intergradation with *zonatus* and does not seem to be worth recognizing by name. On the other hand, birds from Petén and British Honduras have the markings of *restrictus*, but are smaller than specimens from Tabasco. In Verapaz intergradation between *restrictus* and *vulcanius* results in a bird which is not always distinguishable from *zonatus* of Veracruz. If *impudens* be recognized, then certainly a name would also have to be provided for the population of British Honduras and northern Guatemala.

Table 1
Average and Extreme Measurements of *Campylorhynchus zonatus* in Millimeters

Sex	Subspecies	Locality	Wing	Tail
14 ♂	<i>zonatus</i>	N. Veracruz; Puebla	85.3 (80-87, once 91)	85.9 (81.5-87.5, once 91.5)
6 ♂	<i>restrictus</i>	S. Veracruz; Oaxaca	91.0 (87-99)	88.2 (85.5-96.5)
9 ♂	<i>restrictus</i>	E. Tabasco; Campeche	91.6 (87.5-94)	91.7 (87.5-95)
3 ♂	<i>restrictus</i> X <i>vulcanius</i>	Petén	80.8 (78.5-85)	81.5 (77.5-83.5)
1 ♂	<i>restrictus</i> X <i>vulcanius</i>	Baja Verapaz	81	88.5
3 ♂	<i>vulcanius</i>	Mesa Central, Chiapas	87.7 (86-91)	85.2 (82-90)
7 ♂	<i>vulcanius</i>	Sierra Madre, Chiapas	80.7 (78.5-84)	78.0 (75.5-83.5)
5 ♂	<i>vulcanius</i>	Pacific Guatemala	84.3 (83-86)	82.0 (80-87)
3 ♂	<i>vulcanius</i>	Honduras	84.3 (83-86)	81.3 (78.5-83)
11 ♀	<i>zonatus</i>	N. Veracruz; Puebla	80.5 (77-85.5)	81.9 (75.5-86.5)
3 ♀	<i>restrictus</i>	S. Veracruz; Oaxaca; Teapa	85.3 (84.5-86.5)	83.8 (82-85.5)
13 ♀	<i>restrictus</i>	E. Tabasco; Campeche	85.2 (80-89)	85.9 (82.5-90)
4 ♀	<i>restrictus</i> X <i>vulcanius</i>	Petén; British Honduras	80.0 (76-82)	81.3 (78.5-83.5)
3 ♀	<i>restrictus</i> X <i>vulcanius</i>	Quiché; Alta Verapaz	77.7 (74-81)	78.5 (75-82)
8 ♀	<i>vulcanius</i>	Mesa Central, Chiapas	83.1 (76.5-87)	82.6 (77-87.5)
8 ♀	<i>vulcanius</i>	Sierra Madre, Chiapas	80.1 (76.5-83)	80.5 (77-83.5)
4 ♀	<i>vulcanius</i>	Pacific Guatemala	78.4 (77-81)	77.4 (74.5-82)
1 ♀	<i>vulcanius</i>	Honduras	77.5	81.5

Specimens examined.—Veracruz (Paso Nuevo, 4; Buenavista, 2; San Andrés Tuxtla, 1; Jaltipán, 1; Minatitlán, 2). Oaxaca (Guichicovi, 1; Sierra de Santo Domingo, 1; Chivela, 1). Tabasco (Teapa, 1; San Juan Bautista, 1; Frontera, 11, including type; Balancán, 6; Boca del Cerro, 2). Campeche (Palizada, 8). British Honduras (Cayo, 3). Petén (Gavilán, 4). Alta Verapaz (Choctum, 1; San Cristóbal, 1; Finca Samac, 1). Baja Verapaz (Finca Chejel, 1). El Quiché (Joyabaj, 1).

Campylorhynchus zonatus vulcanius (Brodkorb)

Heleodytes zonatus vulcanius Brodkorb, Auk, 57, No. 4 (October, 1940):547 (Aguacaliente, Chiapas).

Characters.—Size small; coloration of under parts pale; abdomen, flanks, and crissum without any markings at all.

Range.—Subtropical or temperate zones of the Mesa Central and Sierra Madre of Chiapas, south through the Pacific cordillera of Guatemala and Honduras, and possibly Nicaragua (none seen by me).

This race is best differentiated in the Sierra Madre and volcanoes of Chiapas. The birds from the Mesa Central, while agreeing in color characters, are slightly larger and are thus somewhat intermediate toward *restrictus*.

Specimens examined.—Chiapas (near Zinacantan, 1; San Cristóbal and vicinity, 3; Teopisca, 1; Canjob, 3; Juncaná, 2, San Vicente near Comitán, 1; Barranca Honda, 1; Letrero, 3; Siltepec, 3; Nuevo Amatenango, 2; Cerro Malé, 2; Aguacaliente, 7, including type). Guatemala (Panajachel, 2; Caderas, 1; Tecpam, 2; Volcán de Acatenango above Dueñas, 1; Antigua, 1). Honduras (Cantoral, 1; Montaña Vasquez, 1; San Juancito, 2).

Department of Biology, University of Florida, Gainesville, Florida, July 14, 1944.

FROM FIELD AND STUDY

Horned Owl Preys on Cooper Hawk.—In early January of 1947, while collecting Horned Owl (*Bubo virginianus*) pellets in the Fern Ridge Reservoir area west of Eugene, Oregon, I came upon a large pellet containing bones somewhat larger than are generally found in pellets of this species. Upon breaking the pellet open, a complete raptor talon was found in addition to several other large bones. The leg piece, consisting of the complete foot, tarsus and a short part of the tibiotarsus, was sent to Stanley G. Jewett for identification. He identified it as a Cooper Hawk (*Accipiter cooperii*).

A short time earlier both wings of a Marsh Hawk (*Circus cyaneus*) were found lying in soft mud a short distance from the site where the pellet was found. There was no evidence of a struggle and the lack of animal prints in the mud indicated that the bird was killed in the air by another bird. Both wings were broken off in the mid-humerus region, and the body was completely gone. These facts would probably indicate that this Marsh Hawk also fell prey to the Horned Owl, since no other bird in this area would be able to kill a hawk of this size in the air, break the bones, and carry the body off.—GORDON W. GULLION, Eugene, Oregon, April 10, 1947.

Screech Owl Egg in Crow's Nest.—In the course of a field trip near Fullerton, California, on April 22, 1945, I was much surprised to find a Screech Owl (*Otus asio*) egg in a set of four American Crow (*Corvus brachyrhynchos*) eggs. A crow was incubating the eggs at the time of discovery and all eggs showed evidence of fertility. The owl egg was compared with several sets of the species in my collection and corresponded closely in size and shape. The nest tree showed no signs of having been climbed prior to my ascent.—EDWARD M. HALL, Whittier, California, January 15, 1947.

Some Bird Records for Southern Nevada.—Linsdale, in his "Birds of Nevada" (Pac. Coast Avif. No. 23, 1936:31), records two Anthony Green Herons taken on May 7, 1934, on the Colorado River opposite Fort Mojave in the extreme southern part of Clark County, Nevada.

On June 30, 1947, the writer observed two Green Herons (*Butorides virescens*) at the mouth of Muddy Creek which enters Boulder Canyon south of Overton, Nevada. On the adjacent mud flats a small flock of seven Western Sandpipers (*Ereunetes mauri*) and one Greater Yellow-legs (*Totanus melanoleucus*) were also seen. These apparently were extremely early fall migrants. Near them were two broods of Cinnamon Teal, a female Shoveller, and two female Mallard ducks.—CLARENCE COTAM, Fish and Wildlife Service, Chicago, Illinois, July 16, 1947.

Black Pigeon Hawk at Santa Barbara, California.—On September 14, 1947, 6 miles east of Santa Barbara, California, in the foothills at 500 feet altitude, two Pigeon Hawks were observed. Shortly thereafter a single individual was taken, probably one of the two first noted. It proved to be a Black Pigeon Hawk (*Falco columbarius suckleyi*); Mr. Egmont Rett of the Santa Barbara Museum made the identification. The bird had eaten at least three dragon flies. There are but four previous records of this race of Pigeon Hawk from southern California, three of which are from Santa Barbara.—EDWARD R. SPAULDING, Santa Barbara, California, October 11, 1946.

A Second Record of the Oven-bird on the Mohave Desert.—Hunt (Condor, 22, 1920:190) reported an Oven-bird (*Seiurus aurocapillus*) on the Mohave Desert of California near Lavic.

On May 13, 1937, I was camping in the broad smoke-tree wash leading down from the Granite Mountains toward Bristol Dry Lake near Amboy. It was about six o'clock in the morning and I was seated before my camp fire writing up my notes of the previous day. Glancing up I saw on the ground before me not more than ten feet away a small bird whose identity was unmistakable: it was none other than the Oven-bird. During the next half hour I had it continuously under observation. The bird was exceedingly unafraid and as it moved about peering under leaves of ground-hugging annuals for insect food, I slowly followed it. It kept close to the ground rising only occasionally to fly to some new feeding place in the broad openings between shrubs or beneath the shelter of smoke-trees (*Dalea spinosa*). The site where I saw this warbler is but thirty miles away from the place where Mr. Hunt observed the species in 1920.—EDMUND C. JAEGER, Riverside College, Riverside, California, June 1, 1947.

White-headed Woodpecker Spends Winter at Palm Springs, California.—I spent the winter of 1915-1916 at Palm Springs, California, on the Colorado Desert. In front of the school building, where I was teaching, was a square 20-foot pole which carried the single telegraph wire which offered the only quick means of communication of the then small village to the outside world. In late November I noticed a White-headed Woodpecker (*Dryobates albolarvatus*) several times a day clinging to the sides of the pole and occasionally near evening going into a hole previously made

near the pole's top by some other woodpecker, probably a Red-shafted Flicker. The hole was apparently regularly occupied at night as a roosting place. The school children were excited about the bird's activities and watched it almost daily throughout the winter until it left on February 24. This is the only occasion on which I have observed this bird of the coniferous forests seeking winter quarters at such a low altitude (457 feet) and on the desert. The occurrence somewhat parallels Moore's record at Redlands, San Bernardino County, California (Condor, 45, 1943:233), and Cogswell's record at Alhambra, Los Angeles County (Pac. Coast Avif. No. 27, 1944:248) except that this bird was plainly no mere vagrant of a day. One wonders what it was that induced it to remain so long away from its usual mountain habitat.—EDMUND C. JAEGER, *Riverside College, Riverside, California, August 12, 1947.*

More Records of the Wood Duck in Arizona.—For several years past the writer has confidently expected that the Wood Duck, *Aix sponsa*, would be authentically added to the avifauna of Arizona. During those years repeated oral reports have reached me, indicating occasional occurrences of the species. Those reports, however, while in the aggregate convincing to the writer, were often indirect or second-hand and could not be made the basis of a scientific record. In some instances they were quite *sub-rosa*, the birds having reportedly been taken by mistake during a hunting season in which they were on the protected list. After all, this species has not been known in Arizona, although it occurs east and west of us, and a considerable degree of unfamiliarity was to be expected.

The most direct and convincing report reaching me was made by Mr. A. A. Nichol, a very competent observer. He reported a few years ago having seen at close range a male Wood Duck at or on the then new Parker Reservoir. Personally I never doubted this record, but the occurrence was in the boundary waters between California and Arizona, and was not reported. By recent letter, Mr. Nichol has informed me that "It was on October 26, 1940, that I saw a male Wood Duck sitting in a dead mesquite tree along the east shores of Parker Lake, just about fifteen miles south of Topock."

Now, in addition to two previously reported sight records—from Tucson by Anderson and Anderson (Condor, 49, 1947:89), and from Phoenix by Pulich (Condor, 49, 1947:131)—we have records from middle eastern Arizona. Game Ranger Al Wilson of Springerville, Apache County, on January 12, 1947, "positively identified a pair on the Little Colorado River about a mile below Lyman Dam" (letter to writer, January 24, 1947).

Somewhat later, Director Reid, of the State Game Department, wrote me that Ranger Wilson had secured a pair of Wood Ducks which would be presented to the University "if we were interested." These specimens came into our possession bearing the date of January 6, 1947, taken on the Little Colorado River below Lyman Dam. Seeking to get the entire record straight, we next learned by letter from Mr. Wilson that he had first identified a pair of Wood Ducks in that location on January 5, 1947, in the open season. Patrolling the area again on January 6, he found the pair (or a pair), freshly killed, in possession of two Spanish-American youths (small boys). Making a deal with the boys, he secured the birds and had them mounted in Alpine, Arizona. These came into our collection as stated, in March, 1947. The pair identified on January 12 was therefore the second pair for that locality within a week.

Both are fine specimens, in full spring plumage. They are nos. 1527 and 1528 in the bird collection of the Department of Entomology and Economic Zoology.—CHARLES T. VORHIES, *University of Arizona, Tucson, Arizona, October 16, 1947.*

Cerulean Warbler in California.—The junior author of this note was at the southeastern edge of Salton Sea, Imperial County, California, with his brother, Bruce E. Cardiff, on October 1, 1947, when a strange warbler was collected. Subsequent examination of the bird with the senior author proved that it was an immature female Cerulean Warbler (*Dendroica cerulea*). Search of the literature indicates that it is a new record for the state of California. The specimen is no. 329 in the Cardiff collection.—WILSON C. HANNA, *Colton, California*, and EUGENE E. CARDIFF, *Bloomington, California, October 13, 1947.*

NOTES AND NEWS

The Brewster Medal was awarded by the American Ornithologists' Union at the annual meetings held in Toronto, September 8-12, 1947, to Francis H. Kortright, author of "The Ducks, Geese and Swans of North America," published in 1942 by the American Wildlife Institute. At the same meetings, Lancelot E. Richdale of Dunedin, New Zealand, was elected a corresponding fellow.

A. C. Bent has finished work on his "Life Histories of the Icteridae and Thraupidae," and is now starting work on the Fringillidae. The first volume on this family is to contain the birds of the 1931 Check-List from the cardinals to the crossbills, inclusive, for which he is ready to receive contributions of notes on habits or photographs.

PUBLICATIONS REVIEWED

THE RUFFED GROUSE: ITS LIFE STORY, ECOLOGY AND MANAGEMENT. By Frank C. Edminster. The Macmillan Company, New York, 1947, xviii + 385 pp., 17 figs. and 56 plates, \$5.00.

This book is a puzzling interspersing of competence and confusion. In many respects it is as good a book as could be written at this time, considering our limited knowledge of this baffling grouse, and considering also the extreme difficulty of learning anything fundamental about a bird that cannot be trapped or banded in quantity and that cannot be bred freely in captivity. On the other hand, some parts of this volume seem foggy both in basic thought and in presentation.

The author is at his best when he discusses predation. Here he possesses the unique advantage of having participated in one of the most important experiments so far made by American game managers: the alternation of control and no control on a pair of similar areas. He is weakest in parts of the chapter called "Biography."

As Lake States grouse hunters, we must first of all question the ecological sufficiency of the author's assertion (p. 269), repeated in various forms throughout the book, that "When woodlands are pastured it is detrimental to grouse and when this pasturing is intense enough to create a visible 'cattle line' it renders the woods practically non-inhabitable to grouse regardless of its other attributes." Our question pertains not to what is included in this assertion, but to what is excluded. To illustrate: in southern Wisconsin, where woods-pasturing has reached an advanced stage and is nearly universal, it has already helped to extinguish the Ruffed Grouse from most counties, and others become grouseless

year by year. Conversely, in parts of central and northern Wisconsin, where the dairy industry is only a few decades old, and where dairy farms, successional speaking, are still in the pioneer stage, the best grouse habitat and the existing cow habitat are often coextensive. Grazing, in our opinion, is a question of degree. It is just like cutting and fire: a little of it in part of the woods is good for grouse; a lot of it all over the woods is lethal.

Wildlife research progresses partly by internal pressure and partly by pulls applied at particular spots by reason of progress in related scientific fields. At the present time a good test for the up-to-dateness of any wildlife research is the author's awareness of recent upward pulls in animal behavior, in physiology, and in the use of statistics.

The present author in his discussion of territory (pp. 50-52) does not limit the term to defended area, and hence confuses the reader in distinguishing territory, home range, and radius of mobility. A more irritating error, repeated in several chapters, is his use of decimal fractions for measurements which could not, in the first instance, have been accurate within five or ten per cent. Thus (p. 213), "the brood mortalities [on two areas] were fifty-two and three-tenths per cent and fifty-six and three-tenths per cent respectively. By calculation, the loss of adults on the trapped area was twenty-three and seven-tenths per cent and that on the untrapped [area] thirty-two and two-tenths per cent." Later on the same page the author discreetly remarks that "detailed accuracy of the results cannot be claimed." Why then the decimals?

Again, on page 297, the writer compares grouse densities based on areas censused in various regions during different years, and he states, "These maxima were: two and seven-tenths, three and five-tenths, four and seven-tenths, four and eight-tenths and seven and three-tenths acres per grouse . . ." Who can census Ruffed Grouse on an area with this accuracy? Misleading fractions are often forgivable in tables where the total must equal 100, but they are not so easily forgiven in text where they imply an accuracy that does not, and often cannot, exist.

Practically all the evidence shown in this book points to non-cyclic behavior of Ruffed Grouse populations in the northeast. This region is peripheral to the extensive range of the bird. The overwhelming evidence for cyclic behavior of the Ruffed Grouse in the Lake States and Canada is conspicuously omitted. It is understandable and expected that an intensive study like this one

will be restricted to a small part of the total range, but it is less understandable that the reader should be given only a provincial picture of a continental phenomenon like the cycle.

The field work for this book was done before the bursa of Fabricius came into general use as an age criterion. It would have been becoming in the author to acknowledge this disadvantage, which detracts considerably from the finality of his conclusions on population mechanics.

The author's command of the literature is good. The bibliography is by chapters. There are good photographs, but the publisher has crowded them all into one central section. There is a fair index. The writing is fair, but some chapters are very difficult to read because data which belong in tables are recited *ad infinitum* as text. We suspect this represents an effort to please the lay reader, but we doubt if it will do so. Nowhere in this book is the reader enlightened as to its relationship to the official report of the New York State Grouse Investigation, now said to be in press, and presumably based upon much of the same field work.

By and large, this book will be an asset to the professional worker in wildlife, and to other workers in the natural history field, but it has many shortcomings which a little less haste and a little better critical reading could have eliminated.—ALDO LEOPOLD and IRVEN O. BUSS.

Useful and worthy is A. L. Rand's "List of Yukon Birds and those of the Canol Road" recently issued by the National Museum of Canada as Bulletin No. 105, 1946; copy received May 7, 1947.

COOPER CLUB MEETINGS

SOUTHERN DIVISION

SEPTEMBER.—The monthly meeting of the Southern Division of the Cooper Ornithological Club was held in Room 145, Allan Hancock Foundation, University of Southern California, Los Angeles, on September 30, 1947, with 105 members and guests present. The following names were proposed for membership: Charles H. Anderson, 1915 Connely Dr., Salinas, Calif., by J. M. Linsdale; Mrs. Earl Jackson, Tumacacori National Monument, Tumacacori, Ariz., by Frank M. Erickson; Elven Rodger, 112 Elm St., Twin Falls, Idaho, by Victor E. Jones; Ira L. Wiggins, Natural History Museum, Stanford University, Calif., by A. H. Miller; Richard Wood Drabble, Box 1768, Palmer, Alaska, and Paul H. Steele, 3487 Barhite St., Pasadena 8, Calif., by Harold Michener; Phil Longenecker, 38 Canterbury Court, Toledo 6, Ohio, and Philip Kenneth Wiseman, Jr., 9908½ Durant Dr., Beverly Hills, Calif., by J. McB. Robertson; Samuel A. Arny, 1435 Octavia St., New Orleans 15, La., Charles K. Barnes, 2026 Lincoln Way West, South Bend 19, Ind., Raymond D. Bourne, 118 E. Vine St., Ox-

ford, Ohio, Mrs. John Q. Burch, 4206 Halldale, Los Angeles 37, Calif., Russell M. Bushey, Madeline, Calif., Tom Hadley, 48 Wellesley Dr., Pleasant Ridge, Mich., Harry Henderson, State Game Warden, Box 380, Belle Fourche, So. Dakota, Donald Keiser, 2323 Gunn Ave., Whittier, Calif., Richard Paul Klein, 24805 Emery Rd., Warrensville Hts., Ohio, Albert Whitney Knox, 344 S. Kingsley Dr., Los Angeles 5, Calif., T. F. Parker, 1717 Crest Dr., Los Angeles 35, Calif., Orville Elmer Randall, State Game Warden, Lemmon, So. Dakota, Kenneth C. Scissons, State Game Warden, Winner, So. Dakota, Walter Scott, 967 S. Sydney Dr., Los Angeles 22, Calif., Robert Wilson Shufeldt, La Cueva Ranch, La Cueva P. O., Mora County, New Mexico, Robert Leo Smith, Rt. 1, Reynoldsville, Pa., Edwin Way Teale, 93 Park Ave., Baldwin, L. I., N. Y., Mrs. H. P. Thomsen, Rt. 3, Box 406, Beloit, Wis., and Michael Throckmorton, 1404 E. Maple Ave., Coeur d'Alene, Idaho, by C. V. Duff.

A resolution concerning the death of Blanche Vignos was submitted by Otto Zahn, Sid Platford and Dr. Adele Lewis Grant and was unanimously adopted.

Luther Little reported on efforts of the Mining Congress and other interests to have the Joshua Tree National Monument abandoned. It was voted that the Southern Division heartily endorse H. R. Bill 2795 to save the Joshua Tree National Monument for scientific research and for future generations and that Mr. Little so advise Congressman Harry R. Shephard.

Ed N. Harrison showed a reel of Kodachrome motion pictures of California Condors. In addition, he spoke on his recent expedition into southern Sonora and northern Sinaloa and showed numerous study skins collected on the trip. Through the kindness and generosity of W. J. Sheffer, also a member of the expedition, a cage containing three pygmy owls and a pair of bat falcons, was exhibited.—DOROTHY E. GRONER, *Secretary*.

NORTHERN DIVISION

SEPTEMBER.—The monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, September 25, 1947, at 8:00 p.m. in Room 2503, Life Sciences Building, University of California, Berkeley, with 57 members and guests present. Proposals for membership were as follows: John A. Keating, 3031 Balboa St., San Francisco 21, Calif., by Hilda W. Grinnell; Adelaide Henkel, Box 463, Deer Lodge, Montana, by W. Lee Chambers; Shirley Powell, Faculty Club, University of California, Davis, Calif., by Mary Koford; Robert S. Arbib, 115 Lafayette Place, Woodmere, N. Y., by John Davis; and Howard Elliott Winn, 398 North Elm St., West Bridgewater, Mass., by C. V. Duff.

The program of the meeting consisted of field reports by members.—CHARLES G. SIBLEY, *Secretary*.

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